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WATER PROTECTION AGAINST SEWAGE CONTAMINATION IN COAL DEPOSITS

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The protection of surface and groundwater from sewage pollution has long become a problem of national importance. Of particular importance is the problem of protecting water resources from pollution by untreated effluents in the coal industry, whose enterprises are characterized by a large volume of discharged mine water. In addition to pollution by mechanical and organic impurities, mine water is characterized by high salinity, which limits their complex use in the national economy without proper treatment, and poses a real danger of pollution of surface and groundwater.

In connection with the growing shortage of fresh water and an increase in the amount of industrial wastewater discharged, the issue of treatment and use of the latter for technical water supply is of great importance. This will allow, on the one hand, to reduce the use of drinking water for needs not related to drinking and domestic water supply, and, on the other hand, to improve the sanitary condition of surface and groundwater.

Despite the increased scientific and technical capabilities, the problem of surface water protection and, in particular, sanitary protection of water basins from pollution by mine waters remains relevant. The degree of influence of mine waters on water basins depends on their quantity, the significance of the water body, etc. In many cases, the water quality of water bodies is deteriorating, which leads to a limitation of their use for drinking, industrial, technical and fishery-economic needs, as well as agriculture.

Therefore, a distinctive feature of mining is the need to drain mineral deposits. To this end, surface reservoirs and watercourses are transferred from the territories planned for the development of deposits or their sections, and measures are being taken to protect the mine workings from flooding with underground waters. The main way to drain the mining zone is to lower it by carrying out various mine works, pumping or draining by gravity, and then dumping significant volumes of groundwater into the hydrographic network outside the developed section.

In practice, three methods of water reduction are usually used - from the surface, underground and combined. The first method involves the construction of drainage devices (wells, ditches, needle filters) directly on the earth's surface. With the underground method, dewatering devices are located in the mine workings. In recent years, when driving underground workings in flooded and unstable rocks of the quicksand type with a low filtration coefficient, bottomhole water reduction is used, consisting in the fact that needle filters are immersed in the rock at various depths. With the help of the sleeves, the needle filters are connected to the drainage collector, in which a sufficiently deep vacuum is maintained, which allows water from the flooded soil to be sucked through the filters. The combined

method is a combination of a method of lowering of water from the surface and underground and is implemented, as a rule, in two stages. Initially, a preliminary reduction of the groundwater level is made from the surface, and then an underground water reduction system is put into operation.

The natural regime of groundwater is disturbed from the moment of opening by the technological mountain or drainage workings of the first aquifer from the surface and after pumping water out of it. At the same time, groundwater reserves are reduced, and the condition and quality of surface waters are significantly deteriorating. A cone of depression is formed over a significant area of the deposit, the dimensions of which depend on the geological and hydrogeological conditions of the deposit area and on the duration of its development.

Depending on the composition of the mine water, various methods and technological schemes for their treatment are used. The most widespread scheme of two-stage cleaning (reagent before settling and filtering). To eliminate the sanitary danger of mine waters, especially when used for technical purposes, they are disinfected, which is carried out in various ways (chlorination, ozonization, radiation, etc.).

The main pollutants, the presence of which in mine waters are directly related to mining, include suspended materials, petroleum products, and bacterial impurities. The enrichment of these pollutants occurs in the process of moving them through the mine workings and the mine's developed space.

Organic pollution is represented by particles of pure coal, mineral oils used to lubricate mining machines and mechanisms, the vital products of living organisms, decomposition of wood, etc., the main component of which is organic carbon. Bacterial contamination of mine water is represented by various microorganisms, among which the most common are mold fungi, gut microbes. Poor mine water in the absence of treatment facilities, getting into surface water bodies and streams, pollute them. This negatively affects the flora and fauna of surface waters, as well as the flora and fauna of forest and agricultural lands of the surrounding territories, and the sanitary and hygienic conditions of the area. The drainage waters of coal deposits are especially polluted.

The following main pollutants are distinguished in the waters pumped from coal mines: suspended particles, mainly coal and rock dust, clay particles, chloride compounds, free sulfuric acid and related salts - iron sulfates, dissolved and suspended phenolic compounds, oils. Pollution factors also include elevated mine water temperature and sewage.

The largest fractions of suspended materials settle in underground catchments. The size and amount of settled particles are determined by the size and capacity of the underground water collectors, the degree of filling with sediment, and the mode of operation of the drainage system. Depending on these factors, the concentration of suspended materials in mine water discharged to the surface varies from 30 to 2000 mg / l for individual mines. However, in most mines, the average concentration of suspended materials does not exceed 1000 mg / l. A relatively lesser degree of contamination is characterized by mines developing highly metamorphosed coals (anthracites and semi-anthracites).

Thus, mining has a direct and indirect effect on natural waters. The first group includes types of impact directly on water bodies, leading to depletion of water reserves, changes in their regimes, condition and quality: drainage of deposits, water withdrawal for technological processes of enrichment, hydraulic overburden, hydraulic production, discharge of drainage and waste water into surface water bodies and watercourses, underground horizons, etc. The next group includes the types of impact on other elements of the environment, as a result of which the condition and quality of natural waters deteriorate.